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Design Features of Photoelectric Asymmetric Concentrators

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Abstract: *this article presents the design characteristics of a photovoltaic asymmetric parabolic cylindrical device. The dimensions of the structure are also indicated.*

Key words: *photoelectric, device, parabolic-cylindrical concentrator, asymmetry, temperature, light, reflected light, current, dimensions, design, design, construction.*

At present, more than 86% of the produced electrical and thermal energy is generated at nuclear power plants and thermal power plants operating on organic fossil fuels. The production of electricity at thermal power plants is accompanied not only by chemical pollution of the environment (only about 5.5 Gt of carbon in the form of carbon dioxide is released into the atmosphere every year) and the depletion of limited natural resources, but also leads to “thermal pollution” of the Earth. The use of nuclear power plants is associated with the problems of ensuring the safety of their operation, processing of radioactive waste and the danger of radiation pollution.

The continuous rise in prices for traditional energy carriers and for electricity, obtained mainly from the combustion of fossil fuels, is primarily due to an increase in the cost of produced fuel and an increase in the cost of its transportation. At the same time, there has been a steady downward trend in the cost of energy from renewable sources.

The use of concentrators in solar installations makes it possible to increase the temperature of the coolant in the case of thermal energy conversion. In photovoltaic conversion, concentrators allow you to increase efficiency and reduce the number of expensive solar cells.

Concentrating systems operating at medium and high concentrations must have tracking systems, this leads to an increase in the cost of the entire structure, complicating operation and reducing reliability.

The use of stationary concentrators with systems of secondary reflectors in the form of linear and angular heliostats will improve the technical and economic performance of a solar concentrating system.

Increasing the efficiency of using solar energy in optical installations is of interest not only for autonomous and remote consumers in the form of individual small villages, farms and individual houses, but also for large-scale solar power plants that can be used both to solve regional optical problems and global ones. energy problems.

The range of issues addressed in the work affects not only the creation of photovoltaic modules for combined energy supply, but also the development of general principles for the development of regional and global energy systems based on solar power plants.

An asymmetric parabolic-cylindrical concentrator is characterized by a width M and a length D of the inlet surface of the midsection of the concentrator. Unlike axisymmetric concentrators, in which the field of view is determined by one parameter of the parametric angle, the field of view of an extended asymmetric concentrator has a more complex form.

On fig. 1 shows a general view of a solar module with a concentrator, where the main mirror reflector is made in the form of one branch of a parabolic cylindrical concentrator with an aperture angle of 36° and two cylindrical mirror reflectors with radii R and d, and the edges of the radiation receiver strip coincide with the optical axis and the branch of the third mirror reflector.

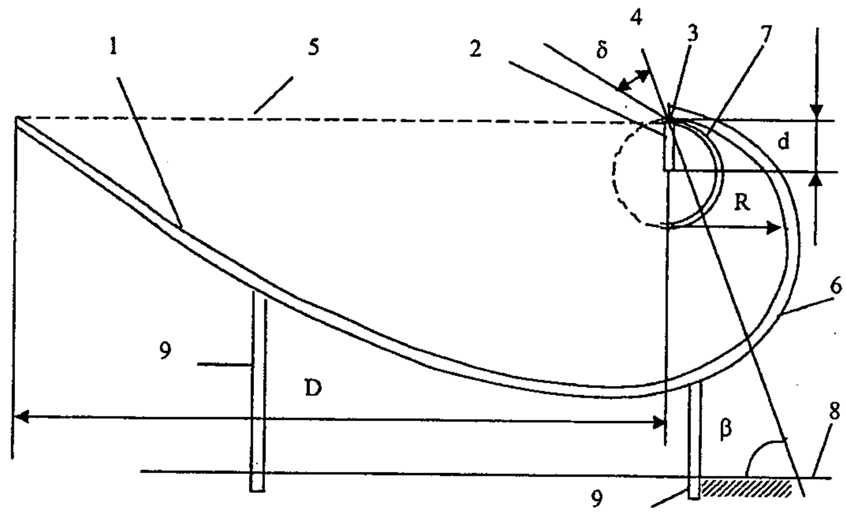

Fig. 1. Stationary asymmetric concentrator with secondary reflector, aperture angle 36° and receiver in vertical plane.

1-focusing parabolic cylindrical mirror reflector; 2- receiver; 3-focal axis; 4-focal plane; 5-hub; 6.7 semi-cylindrical reflector; 8-horizontal plane; 9-support.

The solar module with the concentrator contains the main focusing parabolic-cylindrical mirror reflector 1 with an aperture angle B, a receiver with a double-sided working surface 2, a focal axis 3 and a focal plane of the reflector.

The width of the solar module in the horizontal plane is equal to the width O of the module 5 of the concentrator plus the radius B. Of the second semi-cylindrical reflector 6. The receiver 2 with an optical width 4 is installed perpendicular to the plane of the module 5 between the focal axis 3 and the axis O; third semi-cylindrical mirror reflector 7. The focal plane 3 is inclined to the horizontal plane 8 at an angle B. The solar module with the concentrator 1 is attached to the horizontal plane 8 with the help of supports 9.

The angle β can vary from β_I =113,75°— φ to β_2 =66,250 — $\varphi + \delta$. In the first case β_I he focal plane 4 of the parabolic trough concentrator 1 is directed to the position of the Sun on June 22 (summer solstice), in the second case β_2 — he branch of the parabolic trough concentrator 1 is directed to the position of the Sun on December 22 (winter solstice).

Solar modules with parabolic trough concentrators have been developed for autonomous and large-scale applications. The advantages of the proposed technologies: the cost of electricity is almost independent of the installed capacity; concentrators do not require constant tracking of the Sun; the possibility of using up to 25% of scattered radiation; the concentration coefficient of a solar module with an asymmetric concentrator operating 12 months from 3.5 to 14; at a concentration factor of 3.5, natural cooling is used, and at 5-14, combined heat and power generation is used.

On fig. Figure 2 shows a solar module with an asymmetric parabolic trough concentrator, designed and manufactured at the FerPI test site.

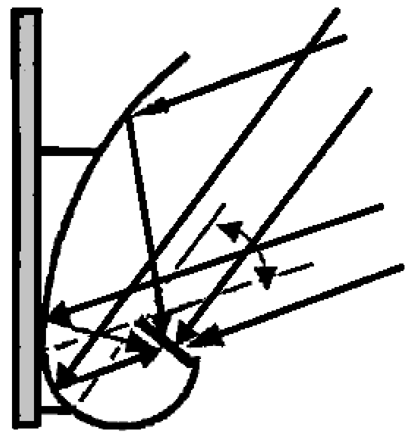

Fig. 2. Solar module with an asymmetric parabolic-cylindrical concentrator, a) the path of the sun's rays.

As a reflective coating, a conventional reflecting mirror with a reflection coefficient of 0.95 was used. This installation uses two one-sided solar modules, each of which consists of 20 solar cells. The size of one element is 50x100 mm2, and the size of the module is 500x100x8 mm2. Module efficiency 12% for (-) external and 11% for (+) internal working surfaces of the solar module. The peak power of the installation according to the results of experiments reduced to standard lighting conditions (1000 W/m2, 30°C) is 85 W. When double-sided solar cells are installed in a solar module with an efficiency of 16%, the calculated peak power can reach 100 W, with an efficiency of 22% -150 W.

The current-voltage characteristics (CVC) were measured using an ammeter and a voltmeter with an adjustable active load, which was rheostats. The electrical parameters of the solar module with a concentrator are determined by calculation according to the data obtained as a result of tests under conditions of natural solar irradiation. Overall dimensions: concentrator 1,45x2,10x0,54 $м^3$; double-glazed window of the solar module: 1.0x0.22x0.008 $м^3$ (Fig. 2 b).

When designing and building an energy-efficient autonomous rural house, first of all, the question of the efficient use of energy resources spent on the energy supply of the house is raised, i.e. consumption of traditional forms of energy. The desired result can be achieved by using available resources available in the region and using energy-saving technologies and solutions that are justified and acceptable from a technical, economic, environmental, social point of view.

References:

1. Елена Геннадьевна Повышение эффективности использования солнечной энергии в энергетических установках с концентраторами. Автореферат. Москва 2008.

2. Содномов Баир Иванович Разработка систем энергоснабжения на основе солнечных модулей с асимметричными параболоцилиндрическими концентраторами автономных сельскохозяйственных объектов забайкалья. Автореферат. Москва 2004.
3. D.S.Strebkov, E.V.Tverjanovich. Solar energy concentrators. Editot-in-chief academican of RAAS D.S.Strebkov. Moscow 2007.
4. Тарнижевский Б.В., Додонов Л.Д. Энергетическая эффективность солнечных установок с комбинированным фототермодинамическим преобразованием. // Теплоэнергетика, 2002, №1
5. М.М. Мухиддинов, С.Ф.Эргашев. Солнечные параболоцилиндрические установки. «Фан» Ташкент 1995г.
6. С. Ф. Эргашев, У.Ж. Нигматов Солнечные параболоцилиндрические установки, конструктивные особенности и расчёт отдельных параметров Universum: технические науки 11-5 (80).
7. С. Ф. Эргашев, У. Ж. Нигматов, Н. Н. Абдуганиев, Б. С.Юнусов Солнечные параболоцилиндрические электростанции-современное состояние работ и перспективы использования их в народном хозяйстве Узбекистана. Достижения науки и образования г.2018 5 (27).
8. Nabiyev M. Moisture Accumulation and Durability of Panel Walls in Aggressive Environment //Eurasian Journal of Engineering and Technology. – 2022. – Т. 5. – С. 40-44.
9. Abdurasulovich N. M. O ‘ZBEKISTONDA TERMOELEKTRIK GENERATORLARDAN FOYDALANISH ISTIQBOLLARI //SO ‘NGI ILMIY TADQIQOTLAR NAZARIYASI. – 2022. – Т. 1. – №. 1. – С. 269-273.
10. Зокиров С. И. У., Норбутаев М. А. СОЛНЕЧНЫЙ ТРЕКЕР ДЛЯ ФОТОТЕРМОГЕНЕРАТОРА СЕЛЕКТИВНОГО ИЗЛУЧЕНИЯ //Universum: технические науки. – 2021. – №. 4-5 (85). – С. 9-13.
11. Kasimaxunova A. M., Norbutaev M., Baratova M. Thermoelectric generator for rural conditions //Scientific progress. – 2021. – Т. 2. – №. 6. – С. 302-308.
12. Abduqaxxorovich O. S. et al. Development and research of heterostructures with an internal thin layer based on p-type silicon //European science review. – 2018. – №. 9-10-1. – С. 183-185.
13. Kasimakhunova A. M., Zokirov S. I., Norbutaev M. A. Development and Study of a New Model of Photothermogenerator of a Selective Radiation with a Removable Slit //Development. – 2019. – Т. 6. – №. 4.
14. Kasimakhunova A. M. et al. Photo Thermal Generator of Selective Radiation Structural and Energetic Features //Journal of Applied Mathematics and Physics. – 2019. – Т. 7. – №. 06. – С. 1263.
15. Tulkinovna A. B. Problems Of The Formation Of Professional Competence Of Students Of A Technical University In The Study Of Foreign Languages And Ways To Solve Them //The American Journal of Social Science and Education Innovations. – 2021. – Т. 3. – №. 12. – С. 43-50.
16. Атаджанова Б. Т. Педагогические Условия И Принципы Формирования Профессионально-Коммуникативной Компетентности Будущего Инженера //Central asian journal of literature, philosophy and culture. – 2021. – Т. 2. – №. 11. – С. 93-97.

17. Tulkinovna A. B. The main formation of professional competence of the students of technical universities in the Russian lessons //Web of Scientist: International Scientific Research Journal. – 2021. – Т. 2. – №. 05. – С. 637-648.
18. Атаджанова Б. Т. Научный текст как источник обогащения профессиональной речи //Вестник педагогики: наука и практика. – 2020. – №. 51. – С. 70-71.
19. Атаджанова Б. Т. Формирование коммуникативной компетенции на уроках русского языка //Достижения науки и образования. – 2019. – №. 8-3 (49). – С. 99-101.
20. Атаджанова Б. Т. Формирование профессионально-коммуникативной компетенции будущего специалиста //Вестник науки и образования. – 2019. – №. 19-2 (73). – С. 47-49.
21. Атаджанова Б. Т. Развитие профессиональной компетентности у студентов как важнейшая задача высшей школы //Достижения науки и образования. – 2018. – №. 17 (39). – С. 46-47.
22. Атаджанова Б. Т. Проблемы изучения лексики русского языка в национальных группах //Достижения науки и образования. – 2018. – Т. 1. – №. 8 (30). – С. 59-60.
23. Рахматова О. К., Косимова Д. Р. Актуальные проблемы преподавания русского языка в технических вузах //Проблемы современной науки и образования. – 2019. – №. 12-2 (145). – С. 127-129.
24. Абдуллаева М. Х., Башарова Г. Г., Рахматова О. К. Преимущества индивидуального подхода в образовательном процессе //Проблемы современной науки и образования. – 2019. – №. 12-1 (145). – С. 88-90.
25. Холматова Д. А., Рахматова О. К. ТЕОРЕТИЧЕСКИЕ ОСНОВЫ РАЗРАБОТКИ УЧЕБНЫХ ПОСОБИЙ //Вопросы науки и образования. – С. 30.
26. Холматова Д. А., Рахматова О. К., Косимова Д. Р. Этнографическая терминология и ее лингвистический анализ (на материалах русского и узбекского языков) //Вестник науки и образования. – 2019. – №. 19-3 (73). – С. 40-42.
27. Nabievna K. B. The study of quantitatively in linguistics //ACADEMICIA: An International Multidisciplinary Research Journal. – 2021. – Т. 11. – №. 3. – С. 1848-1854.
28. Nabievna K. B. MANIFESTATION OF QUANTITATIVELY AT THE LEXICAL LEVEL. – 2022.
29. Ibrokhimov, J. M. (2020). Application of the solar combined systems consisting of the field of flat and parabolocylindrical collecting channels for hot water supply of the industrial factories. Academicia: An international multidisciplinary research journal, 10(12), 1293-1296.
30. Ibrokhimov, J. M. (2021). Features of methods of optimising calculation of parameters the combined solar power installations. Academicia: An International Multidisciplinary Research Journal, 11(5), 1043-1047.

